ADJUSTABLE WORKPIECE SUPPORT ASSEMBLY FOR CONVEYORS

RELATED APPLICATION

[0001] The subject patent application claims priority to all the benefits of U.S. Provisional Patent Application Serial No. 60/453,001, filed on March 7, 2003.

FIELD OF THE INVENTION

[0002] The subject invention relates to a workpiece support assembly for conveyors, and more particularly to the assembly that includes seats or stuffers for positioning a tire against a respective wheel when assembling the same.

BACKGROUND OF THE INVENTION

[0003] With the advent of flexible manufacturing, it has become desirable to process an ever-increasing variety of wheels and tires, through a single assembly line. Numerous assembly lines for mounting tires are known in the prior art and are used today in the automotive industry to provide maximum production efficiency. Typically, the automated assembly line for mounted units includes a central conveyor base to accommodate various work-stations for production of the wheels.

[0004] Generally, the automotive assembly line for mounted units, such as, for example tires and wheels, includes a pair of roller conveyors, whereby each roller conveyor is designed for supporting and transferring the tires and wheels, respectively, when the tires and wheels are received from tire and wheel supplying sources, i.e. stations at the assembly plant. These stations include a tire loader station designed to position the tire on a tire supporting plate operably connected to one of the conveyors. Typically, a wheel loader station, designed to position the wheel on a wheel plate, is

operably connected to another conveyor. A wheel soaper station for applying a lubricant solution onto the edges of the wheel is adjacent to the wheel loader station.

[0005] Another station of the automated assembly line, such as a tire soaper station is also provided at the assembly line for applying the lubricant around the inner circumference of the tire before mounting the tire about the wheel to form the wheel. The assembly line includes a wheel and tire mounting station for mounting lubricated tires onto the respective wheels and a tire inflation assembly for inflating the tire mounted on the wheel. Generally, the wheel is transferred by the first conveyor to the tire mounting station. At the same time, the tire is transferred by the second conveyer, positioned above the first conveyor, to the wheel mounting station. The soaping, i.e. lubricating of the tires and wheels occurs before the tire is mated with the respective wheel at a central conveyor.

[0006] The art is replete with various designs of tire mounters that include tire bed or seat for resting the tire against during mounting the tire onto the respective wheel. The United States Patent Nos. 2,665,747 to Harrison, 3,489,198 to Malinski, 4,163,468 to Mueller, 4,800,944 to Kane, 5,170,828 to Curcuri, and 6,125,904 to Kane et al. disclose a variety of stuffers and seats structured to rest the tire against the seat or stuffer during mounting of the tire onto the respective wheel to slide the tire against its respective wheel to form a wheel.

[0007] The United States Patent No. 5,170,828 to Curcuri teaches an apparatus for integrated tire mounting and inflating performed at a single station that includes a pair of mutually spaced apart stuffers that seat the tire to the wheel. Each stuffer includes a shoe which is pivotally connected with a transfer pallet. Each shoe is further structured to bias against a tread of a tire to cause the tire to abut a wheel to the tires lower end. The apparatus also includes a fluidic actuator having a cylinder,

pivotally connected with a transfer pallet. The actuator includes a piston rod connected with the shoe to move the shoe upwardly and downwardly while mounting the tire on the wheel.

[0008] The United States Patent No. 4,800,944 to Kane teaches a pallet conveyor of a conventional design to carry a plurality of spaced pallets, which in turn carry a vehicle wheel. A tubeless tire is rested in the inclined position upon the wheel. The forward portion of the tire rests upon a seat mounted on the conveyor. The seat causes the tire to abut against the wheel at the tires low end.

[0009] The United States Patent No. 6,125,904 to Kane et al. teaches an apparatus for mounting a tire on a wheel. The apparatus includes a robot having at least one articulated joint and a wrist, a pallet conveyor system, a tire mounting station that includes a tire engaging clamp and a seat. The tire is rested in a predetermined inclined position on the wheel. The edge of the wheel rests against the seat and the tire is held in a non-rotatable position by the clamp.

[0010] Although the prior art tire seats and stuffers for tires are widely used in the automotive industry, one of the areas of continuous development and research is the area of a more advanced design of a stuffer or tire positioner for sliding, positioning, and mounting the tire against a wheel, particularly where an assembly line is intended to process a high number of tire sizes.

BRIEF SUMMARY OF INVENTION

[0011] A contemporary automotive assembly line for mounting tires with respective wheels includes a pair of conveyors designed for supporting and transferring the tires and wheels, respectively, which are received from tire and wheel supplying sources, i.e. stations at the assembly plant. The wheels and tires are

transferred by the first and second conveyors to an assembly for mating the tire with the wheel. The assembly includes a device for supporting the wheel having spaced seats extending around a vertical axis. A tire support for supporting the tire having spaced beads on the wheel with one bead looped between the seats an outside the seats is adjacent the device for supporting the wheel. The assembly includes a tool for forming the seats over the bead with the entire bead disposed between the seats. A tire support of the present invention includes a tread support for engaging the tread of the tire. A side support for engaging the side of the tire is connected to the tread support. The tire support is adjustably supported on the tread support.

[0012] An advantage of the present invention is to provide a tire positioner, where, unlike typical seats and stuffers for tires, the tire positioner of the present invention does not employ the use of springs, or actuators of any kind to adjust the mounting of the tire on the wheel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0014] Figure 1 is an elevational view of a first plate for supporting a wheel adjacent and operably connected to a second plate for positioning a tire;

[0015] Figure 2 is a cross sectional view of Figure 1 having the wheel and the tire shown in phantom; and positioned one with respect to the other on the first and second plates, respectively; and

[0016] Figure 3 is a side view of the second plate having walls of a first supporting element spaced one from the other and extending upwardly from the second plate and arms of a second supporting element connected to the walls, respectively.

DETAILED DESCRIPTION OF THE INVENTION

[0017] A contemporary automotive assembly line for mounting tires **T** with respective wheels **R** includes a pair of conveyors (not shown) designed for supporting and transferring the tires **T** and wheels **R**, respectively, which are received from tire and wheel supplying sources, i.e. stations at the assembly plant (not shown). The wheel **R** is transferred by the first conveyor to an assembly for mating the tire **T** with the wheel **R**, generally shown at **10** in Figures 1 through 3, wherein like numerals indicate like or corresponding parts throughout the several views. At the same time the tire **T** is transferred by the second conveyor, positioned above the first conveyor to the assembly **10**. The soaping, i.e. lubricating of the tires **T** and wheels **R** occurs before the tire **T** is mated with the respective wheel **R**.

[0018] Referring to Figure 1, the assembly **10** of the present invention includes a conveyance device **12** that supports the tire **T** and the wheel **R** and presents a longitudinal axis **A**. A device, i.e. first plate **14** for supporting the wheel **R** having spaced seats extending around a vertical axis **B**. A tire support, i.e. second plate **16** for supporting the tire **T** having spaced beads on the wheel with one bead looped between the seats and outside the seats is adjacent to the first plate **14**. The first **14** and second **16** plates are connected to the conveyance device **12**. The invention includes a tool (not shown) for forming the seats over said bead with the entire bead disposed between the seats. A tread support **18** of the second plate **16** engages the tread of the tire **T**. A side

support **20** of the second plate **16** engages the side of the tire **T**. The side support **20** is adjustable supported on the tread support **18**.

[0019] The conveyance device **12** of the present invention includes a plurality of links, generally indicated at **22** and interconnected one with the other. While link, i.e chain and belt type of conveyance devices may be employed, both being well known to those skilled in the art, only the chain type conveyance device configuration has been described. Hence, the chain type conveyor configuration used in the assembly **10** is not intended to limit the present invention.

[0020] Referring to Figures 1 and 2, the first plate **14** is connected to the conveyance device **12**. A mount **24** for engaging a circular plate **26** defining a peripheral edge **28** is connected to the first plate **14**. The circular plate **26** is operably connected to the mount **24** that is further secured to the first plate **14**. A post **30** extends outwardly from the center of the circular plate **26**. The post **30** includes an inlet portion **32** defined within the post **30** to receive a pin **34** that interconnects the post **30** with the first plate **14** and the circular plate **26**. The post **30** includes a tip **36** at one of the respective ends to house the pin **34**, as shown in Figure 2. The circular plate **26** includes at least one locator **40** concentrically positioned between the peripheral edge **28** and the post **30**. The locators **40** are integral with the circular plate **26** and extend outwardly therefrom, defining a groove **42** therebetween to seal and secure the wheel **R** upon the circular plate **26**.

[0021] As best shown in Figure 2, the second plate **16** is connected to the conveyance device **12** and is spaced from the first plate **14**. The tread support **18** extends upwardly from the second plate **16**. The tread support **18** is defined by a pair of plates **50**, **52** spaced one from the other and extending upwardly from the second plate **16**. Each plate **50**, **52** includes an upper end **54**, a lower end **56**, and side wall **58**, **60**,

extending at an acute angle from the lower end **56** to upper end **54**. The side walls **58**, **60** define an inclined surfaces, generally indicated at **62**, **64** of the plates **50**, **52**, respectively, whereby the inclined surface **62** presents a tread supporting axis **D**. Each plate **50**, **52** further include female connectors defined by first **66** and second **68** slots. The first **66** and second **68** slots extend between the lower **56** and upper **54** ends in a generally vertical direction. The plates **50**, **52** are mechanically adjusted to the second platform **16**. With respect to different operational modes of the present invention, the plates **50**, **52** are movable to and away from the vertical axis **B** along the longitudinal axis **A** to accommodate mating of tires **T** and wheels **R** of various configurations.

[0022] The side support **20** of the present invention is defined by a pair of arms **70**, **72**. Each arm **70**, **72** includes terminal ends **74**, **76**, **78**, **80**, and a female connector, respectively. The female connector of the arms **70**, **72** is further defined by an elongated slot **82** extending between the terminal ends **74**, **76**, **78**, **80**, respectively, whereby only one elongated slot **82** is shown in Figure 2. The arms **70**, **72** are fixed with the respective plates **50**, **52** by a pair of fasteners **90**, **92**. The fasteners **90**, **92** extend through the elongated slot **82** of each arm **70**, **72** and through the first **66** and second **68** slots of the respective plates **50**, **52** to secure each arm **70**, **72** to each plates **50**, **52,** respectively. The arms **70**, **72** are fixedly attached to the plates **50**, **52** to define a predetermined seat, generally indicated at **94** in Figure 2, having an angle that mimics the angle defined between the annular side and the bottom surface of the tire **T**. While either slots **66**, **68**, and **82** defined in the plates **50**, **52** and the arms **70**, **72**, respectively, or a plurality of holes (not shown) spaced one from the other and defined within the plates **50**, **52** and the arms **70**, **72** configurations may be employed, only the plates **50**, **52** and the arms **70**, **72** having elongated slots **66**, **68**, and **82** configurations have been described above and are not intended to limit the present invention.

[0023] The arms **70, 72** may move vertically and horizontally along the plates **50, 52**. With respect to different operational modes of the present invention, the arms **70, 72** are movable upwardly from and downwardly to the second plate **16** to present the seat **94** of various angles defined between the inclined surface of the plates **50, 52** and the terminal ends **74, 78** of the arms **70, 72**. This allows for the for the positioning of the tire **T** upon the respective wheel **R** prior to mounting the tire **T** and wheel **R** together at the assembly line. In addition, the first terminal ends **74, 78** of the arms **70, 72** are movable upwardly and downwardly with respect to the vertical axis **B**. Desirable alignment of the tire **T** to the respective wheel **R** is provided by an angle of the seat **94** defined between the first ends **74, 78** of the arms **70, 72** and the inclined surfaces **62, 64** of each plate **50, 52** of the tread support **18**. As appreciated by those skilled in the art, a plurality of wheels **R** having different diameters may be positioned within and on the circular plate **24**. To provide a desirable alignment between the tire **T** and the wheel **R**, the arms **70, 72** are pre-positioned relative to the slots **66, 68** to provide a seat **94** capable of aligning various sized tires **T** and wheels **R** in a desirable relationship.

[0024] While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.